

Claim Listing

1. (Original) A nutating pump comprising:

a pump housing;

a prime mover having a drive shaft with a shaft axis, the drive shaft being driven by the prime mover about the shaft axis relative to the pump housing;

a plurality of pumping cylinders with axes radially disposed about and generally parallel with the shaft axis, said pumping cylinders being fixed relative to the pump housing;

a plurality of wobble pistons, one said wobble piston for each pumping cylinder, each said wobble piston having a piston head and a piston rod fixedly connected to the piston head, each said piston head being received in the associated pumping cylinders in a fit that permits wobbling motion of the piston head relative to the pumping cylinder as the piston is reciprocated;

a wobble member connected to the piston rods; and

a universal joint connecting the wobble member to the housing.

2. (Currently Amended) A nutating pump as claimed in claim 1, wherein the ~~nutating~~ wobble member is connected to the piston rods with a ball and socket joint.

3. (Currently Amended) ~~A nutating pump as claimed in claim 2,~~ A nutating pump comprising:

a pump housing;

a prime mover having a drive shaft with a shaft axis, the drive shaft being driven by the prime mover about the shaft axis relative to the pump housing;

a plurality of pumping cylinders with axes radially disposed about and generally parallel with the shaft axis, said pumping cylinders being fixed relative to the pump housing;

a plurality of wobble pistons, one said wobble piston for each pumping cylinder, each said wobble piston having a piston head and a piston rod fixedly connected to the piston head, each said piston head being received in the associated pumping cylinders in a fit that permits wobbling motion of the piston head relative to the pumping cylinder as the piston is reciprocated;

a wobble member connected to the piston rods with a ball and socket joint; and

a universal joint connecting the wobble member to the housing, wherein each ball and socket joint includes a fixed member and a biased member.

4. (Original) A nutating pump as claimed in claim 3, wherein the fixed members transmit a force of pumping between the wobble member and the wobble pistons during a power stroke of the wobble piston.

5. (Original) A nutating pump as claimed in claim 3, wherein the wobble member is positioned axially between the fixed member and the head of the wobble piston for vacuum pistons of the pump.

6. (Currently Amended) ~~A nutating pump as claimed in claim 1,~~ A nutating pump comprising:

a pump housing;

a prime mover having a drive shaft with a shaft axis, the drive shaft being driven by the prime mover about the shaft axis relative to the pump housing;

a plurality of pumping cylinders with axes radially disposed about and generally parallel with the shaft axis, said pumping cylinders being fixed relative to the pump housing;

a plurality of wobble pistons, one said wobble piston for each pumping cylinder, each said wobble piston having a piston head and a piston rod fixedly connected to the piston head, each said piston head being received in the associated pumping cylinders in a fit that permits wobbling motion of the piston head relative to the pumping cylinder as the piston is reciprocated;

a wobble member connected to the piston rods; and

a universal joint connecting the wobble member to the housing wherein piston rods of the wobble pistons are hollow.

7. (Currently Amended) A nutating pump as claimed in claim 6, wherein the piston rods contain ~~the~~ a ball and socket joint.

8. (Original) A nutating pump as claimed in claim 7, wherein the piston rods contain springs that bias parts of the ball and socket joints together.

9. (Currently Amended) ~~A nutating pump as claimed in claim 1,~~ A nutating pump comprising:

a pump housing;

a prime mover having a drive shaft with a shaft axis, the drive shaft being driven by the prime mover about the shaft axis relative to the pump housing;

a plurality of pumping cylinders with axes radially disposed about and generally parallel with the shaft axis, said pumping cylinders being fixed relative to the pump housing;

a plurality of wobble pistons, one said wobble piston for each pumping cylinder, each said wobble piston having a piston head and a piston rod fixedly connected to the piston head,

each said piston head being received in the associated pumping cylinders in a fit that permits wobbling motion of the piston head relative to the pumping cylinder as the piston is reciprocated;

a wobble member connected to the piston rods; and

a universal joint connecting the wobble member to the housing wherein each piston rod is longer than the distance from the axis of the drive shaft to an axis of a cylinder associated with the piston rod.

10. (Original) A nutating pump as claimed in claim 1, wherein each piston head has a cup seal that forms a sliding seal with the associated pumping cylinder.